

Extended distribution of *Geodorum laxiflorum* (Orchidaceae) in Gujarat, India^a

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Abstract

Geodorum laxiflorum W.Griffith, an endemic species of India, is reported for the first time from Gujarat state as well as from the Western Ghats. A detailed description and photographs are provided for easy identification of the species. Information about its phenology, distribution, habitat, ecology and conservation status is provided. Besides a lectotype is designated for the species.

Résumé

Extension de la distribution géographique de *Geodorum laxiflorum* (Orchidaceae) à Gujarat (Inde) – *Geodorum laxiflorum* W.Griffith, espèce endémique d'Inde, est enregistrée pour la première fois dans l'État de Gujarat et dans les Western Ghats. Une description détaillée accompagnée de photographies est proposée pour faciliter l'identification de l'espèce. Des informations sur sa phénologie, sa distribution géographique, son habitat, son écologie et son statut de conservation sont également fournies. En outre un lectotype est désigné pour l'espèce.

Introduction

The genus *Geodorum* G.Jackson is an Indo-Malesian genus of about twelve species (Govaerts *et al.*, 2015). The generic name is derived from the Latin word *geo*, meaning 'earth', in reference to its habit. It is one of the most

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complicated genera within the Orchidaceae. Due to insufficient or lacking type material, the validity of the species has been questioned by Seidenfaden in his review of the genus (Seidenfaden, 1983). Although he did not manage to resolve all the problems, he accepted 31 species and called for a full monographic study. Pearce & Cribb (2002) suggested to accept 10 species for this genus.

These terrestrial orchids have sub-globose corms and few plicate leaves present during flowering but not yet fully developed. Inflorescence lateral, apically curved, usually shorter than leaves, laxly few to many flowered. However, to a large extent, various characters (such as scape shorter or longer than the leaves, raceme few or many flowered, lip shape, lip lobed or unlobed, ornamentation of the disc, whether smooth or keeled) have been relied upon to differentiate species. These characters overlap from one species to another up to such a degree that it is difficult to separate out these species.

In India the genus is represented by six species, namely *Geodorum appendiculatum* W.Griffith, *Geodorum densiflorum* (Lamarck) Schlechter, *Geodorum laxiflorum* W.Griffith, *Geodorum pallidum* D.Don, *Geodorum recurvum* (Roxburgh) A.Alston and *Geodorum attenuatum* W.Griffith. (Misra, 2007; Kumar *et al.*, 2008; Govaerts *et al.*, 2015).

During the orchid survey in Gujarat state the first author came across an interesting population of *Geodorum* in July, 2014 in Waghai taluka of the Dangs district. The district is located in the south-eastern part of the state and is part of the Western Ghats. The forests are mostly moist and deciduous vegetation. The average rainfall is 2000 mm, the rains commence in mid June and last until the end of October. At that time the *Geodorum* population was reported in vegetative stage. A year later (24 July, 2015) the first author revisited the locality and reported it in flowering stage. On critical observation and perusal of relevant literature (Seidenfaden, 1983; Hooker, 1890; Misra, 2007) it was identified as *Geodorum laxiflorum*. The perusal of relevant literature revealed that the species has hitherto not been reported from Gujarat (Suryanarayana, 1968; Desai, 1976; Shah, 1978; 1983; Vora, 1980; Reddy, 1987; Bole & Pathak, 1988; Tadvii, 2014) as well as from Western Ghats (Santapau & Kapadia, 1966; Abraham & Vatsala, 1981; Karthikeyan *et al.*, 1989; Satish Kumar & Manilal, 1994; Jalal & Jayanthi, 2012; Nayar *et al.*, 2014). Hence the present report is not only an extended distribution to the western part of India but also a new distribution record

for the Western Ghats. We present here the systematic treatment of this taxon along with a brief description, photographs, ecological notes and conservation status.

Systematic treatment

Geodorum laxiflorum W.Griffith, *Calcutta Journal of Natural History and Miscellany of the Arts and Sciences in India* 5: 356 (1845); J.D.Hooker, *Flora of British India* 6: 18 (1890); G.Seidenfaden, *Opera Botanica* 72: 51 (1983); S.Misra, *Orchids of Orissa*: 560 (2004).

Type: India, Assam, *sine loc.* Jenkins, *sine no.* ; material not found, probably not any longer existing. Drawing by Griffith in K, here designated as **lectotype**, in accordance with art. 9 of the Melbourne Code.

Plant terrestrial, 30-50 cm tall (including leaves); corm 4.5-5 cm, ovoid, slightly compressed, greenish brown, with scars of fallen leaves; roots few, vermiform, ca. 0.2 cm thick; pseudostem ca. 10 × 1 cm, enclosed by four foliar imbricating sheaths; leaves 2-4, cauline, alternate, elliptic lanceolate, acute, undulate, subequal, 13-36 × 8-12 cm, many veined, midvein prominent beneath; inflorescence lateral from the base of newly developed leafy shoot and shorter than it, 20-30 cm; peduncle erect, 20-27 × 0.2 cm, green, decurved at the top, with four membranous tubular sheaths; raceme laxly flowered with 6-12 medium sized flowers; rachis decurved, ca. 2.5-4 cm long with two sterile bracts; bracts green, oblong lanceolate, ca. 1.1 × 0.3 cm, membranous with acute apex, 3 veined; pedicel with ovary 1.3 cm long, ribbed; flowers white off-white, sepals and petals spreading, 1.5-2.5 cm across; sepals subequal, 5-veined, oblong lanceolate; dorsal sepal ca. 2.1 × 0.6-0.7 cm; lateral sepals ca. 2.2 × 0.8 cm; petals broader, obovate oblong, ca. 2.3 × 1.2 cm, apex acute obtuse, 7-veined; lip ca. 2.1 × 1.5-1.7 cm, broadly obovate, emarginated, sessile on the base of column, entire, ventricose at the base; sides of the hypochile erect; epichile undulate, edge deflexed, two irregular rows of thick warts starting from the base of the epichile and ending before the apex, hypochile golden brown within, epichile yellow at base and pink at apex; column stout, short, oblong, slightly dilated, ca. 0.5-0.6 × 0.3 cm long; stigma squarish, ca. 0.2 cm long, anther broadly ovate orbicular in outline, ca. 0.3-0.4 cm, off-white with brown tinge, the locules pouch like; pollinia yellow, obliquely oblong ovoid, porate behind, ca. 0.2 × 0.15 cm, stipe hyaline, subquadrate (Fig. 1).

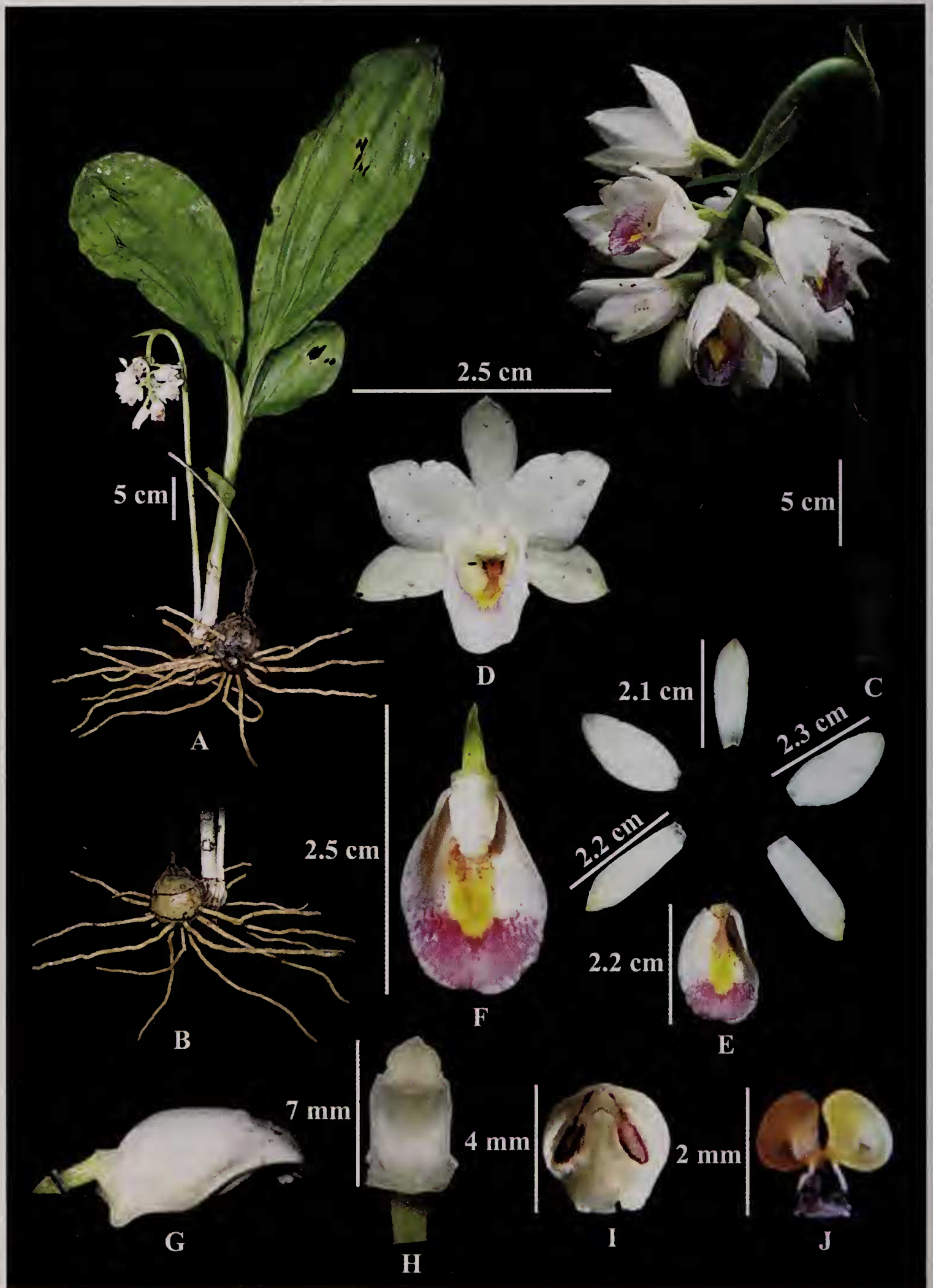


Fig. 1 : *Geodorum laxiflorum*

A: habit – B: tuber – C: inflorescence – D: flower – E: flower segments – F: lip with column and ovary – G: lip (side view) – H: ovary and column – I: anther cap – J: pollinia (ph. M.R.Bhatt)

Flowering: June-July; fruiting: August-October.

Etymology: this species name is derived from the Latin words, *laxo* meaning 'loose' and *flos* meaning 'flower'. General distribution: India (Assam, Chhattisgarh, Odisha, Jharkhand, Gujarat); endemic.

Habitat & ecology: the habitat is dominated by tropical moist deciduous forests with an average rainfall of 2000 mm. The species was found growing in black clay soil in the shade of bamboo in association with *Sida rhombifolia* Linnaeus, *Curculigo orchioides* J.Gaertner, *Curcuma decipiens* Dalzell, *Adiantum* sp. It was observed that the inflorescence in this orchid emerges as soon as the pre-monsoon rainfall starts.

Taxonomic note: this species was first reported by D.T.Jenkins from Assam and planted in the Indian Botanic garden, in Calcutta. G.W.Griffith described it in 1845. According to Griffith this species is allied to *Geodorum dilatatum* R.Brown (= *Geodorum recurvum*), but differs from it by its spike of thin flowers, the broad petals and the broadly ovate squarish lip. Hooker (1890) listed this species among the doubtful species, clearly noting the close resemblance with *Geodorum citrinum* G.Jackson. However *G. citrinum* has yellow flowers, an oblong pollinarium gland which is truncate at the apex, without any teeth on its lateral edges. According to Seidenfaden (1983) the Griffith's species is not *G. citrinum*. However this species was reported by Misra (2004) from Ganjam district of Odisha and Kumar (2008) from Jharkhand state.

Specimen examined: India, Gujarat, Dangs, Waghai (20°45.085'N - 73°29.680'E), 156 m, 8.10.2014 (flowered in 17.7.2015), M.R. Bhatt 142 (BSI Jodhpur).

Conservation status: as already said, *Geodorum laxiflorum* is endemic to India. As indicated on Fig. 2, there are eight localities known for this species based on the present field survey, herbarium records and literature over the period 1845-2015. These localities were imported into GeoCAT (Bachman *et al.*, 2011; <http://geocat.kew.org/>) and the extent of occurrence (EOO) was calculated to be 559,086.343 km² (far exceeding the 20,000 km² upper limit for "Vulnerable" status under the criterion B1 (under IUCN criteria 'B' of geographical range), while area of occupancy (AOO) was calculated to be 32 km² (which falls within the limits for "Endangered" status under the criterion B2). The number of localities exceeds the upper limit for endangered status. Habitat fragmentation due to clearing forest

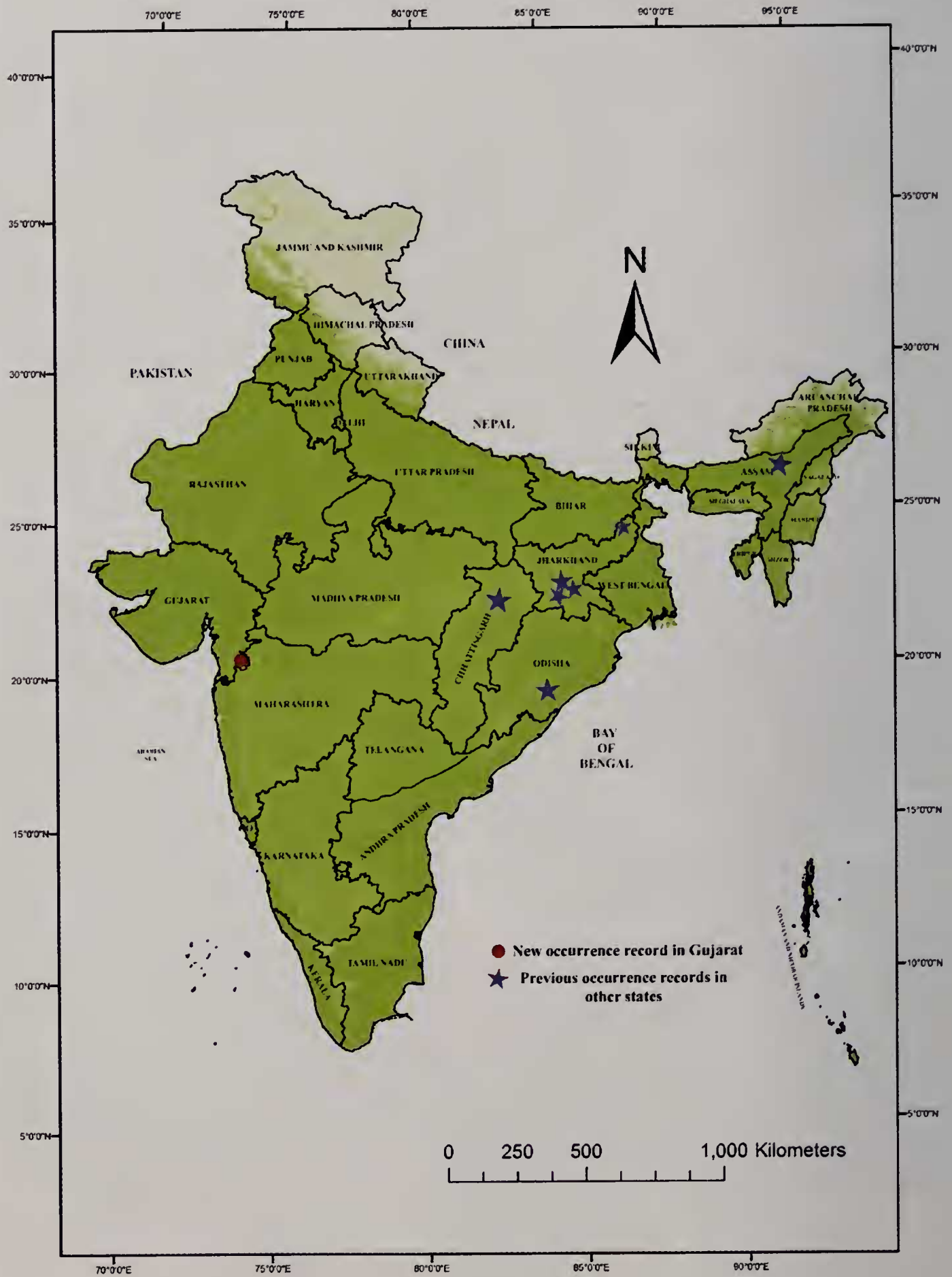


Fig. 2 : Distribution of *Geodorum laxiflorum* in India

for agricultural use and shifting cultivation in north east region of India are the main threats. In Jharkhand and Odisha, *G. laxiflorum* is also reported to be rare (Kumar, 2008; Misra, 2004) due to human induced activities,

industries, mining, settlement, development projects and removal of forest products, over grazing and forest fires. In Chotanagpur region of Jharkhand state it is also collected by the local practitioners as it is being used in curing in malignant tumours, stomach ache and joint pain (Besra *et al.*, 2011). It has not been reported from Assam after its first record. In the present survey only 25-30 individuals were located in Dangs district of Gujarat state. The particular site is prone to soil erosion due to agricultural invasion. Based on the present observations we conclude that it should be evaluated as “Vulnerable” under the B2ab(i,ii,iii,iv) criteria of the IUCN red list guidelines (2001: version 3.1). The *ex situ* conservation efforts for this species were made by the Forest Department Ahwa, Dangs and Maharaja Sayajirao University of Baroda, Vadodara.

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